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Ryoichi Komiya

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JORDAN AND HAMBURG LLP  
122 EAST 42ND STREET  
SUITE 4000  
NEW YORK, NY 10168

EXAMINER

MOWLA, GOLAM

ART UNIT

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/528,880	<b>Applicant(s)</b> KOMIYA ET AL.	
	<b>Examiner</b> GOLAM MOWLA	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09/02/2008 and 03/02/2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 11-36 is/are pending in the application.
- 4a) Of the above claim(s) 34 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 11-33, 35 and 36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **FINAL ACTION**

### ***Election/Restrictions***

1. Applicant's election of Species B in the reply filed on 03/02/2009 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

### ***Response to Amendment***

2. Applicant's amendment of 09/02/2008 does not place the Application in condition for allowance.

3. Claims 11-36 are currently pending. Applicant has amended claims 11, 17, 18, 21, 28 and 29, cancelled claims 1-10, and added new claims 31-36.

4. Claim 34 is withdrawn from consideration as being part of non-elected group.

5. The amendment filed 09/02/2008 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

- The added limitation "wherein the network structure is formed by reacting at least one compound A having at least two isocyanate groups with at least one compound B having at least two amino groups, with the proviso that, if compound A has two isocyanate groups, compound B has at least

three amino groups” in lines 10-13 of claim 11 is not supported by original disclosure; and

- The added limitation "with the proviso that, if the number of isocyanate groups in A is two, the number of carboxyl groups, or the number of hydroxyl groups, or the number of hydroxyl and carboxyl groups combined in compound C is at least three” in lines 16-18 of claim 18 is not supported by the original disclosure.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Status of the Objections or Rejections***

6. The objections to the claims are withdrawn in view of Applicant's amendment.
7. Due to Applicant's amendment of claims 11, 17, 18, 21, 28 and 29, all rejections from the office Action mailed on 04/28/2008 are withdrawn. However, upon further consideration, a new ground(s) of rejection is/are presented below.

***Comments***

8. Claims 14-16 and 21-23 are product-by-process claims, therefore the claims are not limited to the manipulation of the recited method of forming the network structure such as heating, mixing, reacting. The determination of patentability is based on the product, and not on the method (method of forming the network structure such as heating, mixing, reacting) of making the product. See MPEP 2113 [R-1] Product-by-Process Claims. See also *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

***Claim Rejections - 35 USC § 112***

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claims 11-33 and 35-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

As amended, independent claim 11 recites the limitation "wherein the network structure is formed by reacting at least one compound A having at least two isocyanate groups with at least one compound B having at least two amino groups, with the proviso that, if compound A has two isocyanate groups, compound B has at least three amino groups" in lines 10-13 (see claims as filed on 09/02/2008). There is no support for this limitation in the originally filed disclosure.

As amended, independent claim 18 recites the limitation "with the proviso that, if the number of isocyanate groups in A is two, the number of carboxyl groups, or the number of hydroxyl groups, or the number of hydroxyl and carboxyl groups combined in compound C is at least three" in lines 16-18 (see claims as filed on 09/02/2008). There is no support for this limitation in the originally filed disclosure.

Claim 35 recites the limitation that "...compound B is selected from the group consisting of: diethyltoluenediamine, dimethylthiotoluenediamine, and a trifunctional

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polyetheramine" in lines 1-3. The original disclosure does not provide support for "dimethylthiotoluenediamine."

11. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

12. Claims 11-33 and 35-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949).

In the present instance, independent claim 11 recites the broad recitation "wherein the network structure is formed by reacting at least one compound A having at least two isocyanate groups with at least one compound B having at least two amino

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groups” in lines 10-13, and the claim also recites “with the proviso that, if compound A has two isocyanate groups, compound B has at least three amino groups” which is the narrower statement of the range/limitation.

In addition, independent claim 18 recites the broad recitation “with the proviso that, if the number of isocyanate groups in A is two, the number of carboxyl groups, or the number of hydroxyl groups, or the number of hydroxyl and carboxyl groups combined in compound C is at least three” in lines 8-11, and the claim also recites “with the proviso that, if the number of isocyanate groups in A is two, the number of carboxyl groups, or the number of hydroxyl groups, or the number of hydroxyl and carboxyl groups combined in compound C is at least three” in lines 16-18, which is the narrower statement of the range/limitation.

Claim 36 is indefinite because it recites the limitation “compound C is selected from the group consisting of: difunctional ethylene oxide/propylene oxide copolymer obtained using glycerin as a starting material, trifunctional ethylene oxide/propylene oxide copolymer obtained using ethylene glycol as a starting material, polyether-modified polycarbonate diol, and polyethyleneglycol” in lines 1-5. Polyether-modified polycarbonate diol renders the claim indefinite because polyether-modified polycarbonate diol has two functional groups (as shown by the Applicant in Appendix A), and therefore will not satisfy the proviso. In addition, polyethyleneglycol also renders the claim indefinite because polyether-modified polycarbonate diol has two functional groups (as shown by the Applicant in Appendix A), and therefore will not satisfy the proviso. Applicant is asked to clarify.

***Claim Rejections - 35 USC § 103***

13. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

14. Claims 11, 14-17, and 24-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi et al. (US 6376765, hereafter "Wariishi '765") in view of Wariishi (EP 0986080, hereafter "Wariishi '080").

Regarding claims 11, 14 and 15, Wariishi '765 discloses a dye-sensitized solar cell comprising a transparent substrate (transparent substrate 50a, fig. 1; Col. 22, lines 13-37), a transparent electrically-conductive membrane (transparent electrically conductive layer 10a, fig. 1; Col. 22, lines 13-37) formed (see fig. 1 which shows that 10a is formed on 50a) on the surface of the transparent substrate (50a), an electrically-conductive substrate (40a, fig. 1; Col. 22, lines 13-37) disposed opposed to the transparent electrically-conductive membrane (10a), a porous semiconductor layer having a dye adsorbed thereto (photosensitive layer 20 comprising semiconductor particles 21 sensitized by a dye 22, Col. 22, lines 13-19; see also fig. 1) and an electrolyte (charge transport layer 30 containing electrolyte composition, Col. 55, lines 1-10, Col. 22, lines 13-37; see also fig. 1) interposed between said transparent electrically-conductive membrane (10a) and said electrically-conductive substrate (40a), said electrolyte (30) comprising a molten salt ("The electrolyte composition ... comprises...a salt having a low melting point, a so-called molten salt", Col. 5, lines 26-38) incorporated in a network structure (The electrolyte composition is gelled or solidified by a cross-linking reaction of a polymer, Col. 19, lines 53-57) obtained by



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crosslinking at least one kind of Compound A having isocyanate groups per molecule (cross-linking agent...acyl isocyanates; Col. 21, lines 53-57) with at least one kind of Compound B having amino groups per molecule (pyridine group; Col. 21, lines 44-57). It is Examiner's position that nitrogen containing polymer such as pyridine has an amino group, either a secondary or tertiary amino group.

Network is an interconnected or interrelated chain, group, or system (Dictionary definition of "network" provided by Merriam-Webster Online Dictionary). Since the crosslink interconnects the isocyanate and amino groups, Wariishi inherently discloses that the cross-linking reaction of polymers allows forming a network structure.

The reference, however, is silent as to whether the network structure is formed by reacting at least one compound A having at least two isocyanate groups with at least one compound B having at least two amino groups, with the proviso that, if compound A has two isocyanate groups, compound B has at least three amino groups.

Wariishi '080 describes a photovoltaic cell of dye sensitization type comprising a transparent substrate (7), a transparent conductive film (6) formed on a surface, a conductive substrate (combination of glass layer 1 and conductor layer 2) opposite to conductive film (6), a porous semiconductor layer (3) in which a dye is adsorbed (dye layer 4), and an electrolyte layer (electrolyte containing crosslinked polymer, see abstract) between the transparent conductive film (2) and conductive substrate (6+7). (See paragraphs [0087]-[0090]). The electrolyte is a gel electrolyte containing a redox material and a solvent capable of dissolving the redox material in a network structure (See paragraphs [0033]-0036]). The network structure is formed by crosslinking a least

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one kind of compound A (electrophilic reagent) having bi-or higher functionality such as isocyanate to react on a nitrogen-containing polymer (See section titled "Summary of the Invention" and paragraph [0023]) and at least one kind of compound B, or nitrogen containing polymer as seen in formula I-a, in which the nitrogen containing group Z is repeated by a factor of x. (See paragraphs [0011]-[0021]). Wariishi also teaches that x is up to 70 as seen in formulas 1-1 to 1-52. It is the Examiner's position that nitrogen-containing polymers such as amide, imidazole, etc... have at least an amino group, wherein each of the amino group having at least one active hydrogen.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the network structure as disclosed by Wariishi '080 in the solar cell of Wariishi '765 in order to allow for a solar cell which possesses excellent photoelectric characteristics and durability (see abstract of Wariishi '080).

Regarding claims 16 and 17, Wariishi '765 further discloses that the electrolyte comprises an oxidation-reduction pair (formula 1 on Col. 5, line 38 shows a positive cation and negative anion as the oxidation-reduction pair; See also Col. 7, lines 8-15 and Col. 55, lines 51-54).

Regarding claim 24, Wariishi '765 further discloses that molten salt comprises a salt having a melting point of lower than room temperature (Col. 5, lines 41-43)

Regarding claim 25, Wariishi '765 further discloses that molten salt takes part in the production of an oxidation-reduction pair (formula 1 on Col. 5, line 38 shows a positive cation and negative anion as the oxidation-reduction pair; See also Col. 7, lines 8-15, and Col. 55, lines 51-54)

Regarding claims 26-28, Wariishi '765 further discloses that molten salt has a pyridinium or imidazolium heterocyclic compound as cation (Col. 7, line 55 – Col. 8, line 60) containing quaternary nitrogen (see formula 4 and 5 on Col. 8).

Regarding claim 29, Wariishi '765 further discloses that the molten salt has an iodide ion as anion (Col. 7, lines 8-14).

15. Claims 12-17 and 24-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Wariishi '080 as applied to claim 11 above, and further in view of Takaoka et al. (US 6589383).

Regarding claim 12, Wariishi '765 in view of Wariishi '080 discloses a dye-sensitized solar cell as discussed above for claim 11. The references are silent as to whether at least one of said compound A and said compound B comprises a polymer structure having a molecular weight of from 500 to 100,000.

Takaoka teaches the crosslinking polymer structure involved in forming gel electrolyte having a molecular weight of 20,000 or less, in solid electrolyte is 5000 - 20,000 (Col. 15 lines 52-58). The ranges of molecular weight of 20,000 or less for gel electrolyte and 5000 - 20,000 for solid electrolyte are well within the claimed range of 500 - 50,000 for gel electrolyte, and 500 - 20,000 for solid electrolyte. Takaoka uses a low molecular weight polymer because it allows for a reduced difficulties in handling the polymer (Col. 15, lines 52-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified molecular weight of Takaoka in the dye-

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sensitized solar cell of Wariishi '765 in view of Wariishi '080, because it allows for a reduced difficulties in handling the polymer, as taught by Takaoka.

Regarding claim 13, Wariishi '765 in view of Wariishi '080 discloses a dye-sensitized solar cell as discussed above for claim 11. The references are silent as to whether a part or whole of the polymer structure of said Compound A and said Compound B comprises one or more selected from the group consisting of polyether, polyester, polycaprolactone, polysiloxane, polyolefin, polybutadiene, polyisoprene, polycarbonate and polyphosphazene.

Takaoka teaches the polymer structure, either entirely or partially, is one or more selected from a group consisting of polycarbonate (See '383 col. 6 line 48), polyester (Col. 6, lines 48-49), polyether (Col. 6 lines 64-66 and Col. 7 lines 1-5), polysiloxane (See formula B-1). Takaoka also teaches using polyether that has formulae equivalent to applicant's formula (I) (Col. 7 lines 1-5). Takaoka uses the specified polymer because it provides for an excellent ionic conductivity (Col. 1, lines 35-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified polymer structure of Takaoka in the dye-sensitized solar cell of Wariishi '765 in view of Wariishi '080, because it allows for an excellent ionic conductivity, as taught by Takaoka.

Regarding claims 14-17, Wariishi '765 further discloses that the network structure (The electrolyte composition is gelled or solidified by a cross-linking reaction of a polymer, Col. 19, lines 53-57) obtained by crosslinking at least one kind of Compound A having isocyanate groups per molecule (cross-linking agent...acyl isocyanates; Col. 21,

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lines 53-57) with at least one kind of Compound B having amino groups per molecule (pyridine group; Col. 21, lines 44-57), and electrolyte comprises an oxidation-reduction pair (formula 1 on Col. 5, line 38 shows a positive cation and negative anion as the oxidation-reduction pair; See also Col. 7, lines 8-15 and Col. 55, lines 51-54).

Regarding claim 24, Wariishi '765 further discloses that molten salt comprises a salt having a melting point of lower than room temperature (Col. 5, lines 41-43)

Regarding claim 25, Wariishi '765 further discloses that molten salt takes part in the production of an oxidation-reduction pair (formula 1 on Col. 5, line 38 shows a positive cation and negative anion as the oxidation-reduction pair; See also Col. 7, lines 8-15, and Col. 55, lines 51-54)

Regarding claims 26-28, Wariishi '765 further discloses that molten salt has a pyridinium or imidazolium heterocyclic compound as cation (Col. 7, line 55 – Col. 8, line 60) containing quaternary nitrogen (see formula 4 and 5 on Col. 8).

Regarding claim 29, Wariishi '765 further discloses that the molten salt has an iodide ion as anion (Col. 7, lines 8-14).

16. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Wariishi '080 as applied to claim 11 above, and further in view of Sugihara et al. (US 6274806).

Wariishi '765 in view of Wariishi '080 discloses a dye-sensitized solar cell as discussed above for claim 11. Wariishi '765 further discloses that the semiconductor layer has a specific surface area of  $2 \text{ m}^2/\text{g}$  (Col. 26, lines 14-22). However, Wariishi '765

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is silent as to whether the semiconductor layer has a specific surface area of from 10-200 m<sup>2</sup>/g.

Sugihara discloses a dye-sensitized solar cell (Col. 1, lines 33-37) wherein the semiconductor layer has a specific surface area of 100 m<sup>2</sup>/g. Sugihara uses the specified surface area because this allows for a solar cell with high performance (Col. 5, lines 38-40).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize the specific surface area of Sugihara in the dye-sensitized solar cell of Wariishi '765 in view of Wariishi '080, because this allows for a solar cell with high performance, as taught by Sugihara.

17. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Wariishi '080 and Takaoka as applied to claim 11 or claim 12 above, and further in view of Sugihara et al. (US 6274806).

Wariishi '765 in view of Wariishi '080 discloses a dye-sensitized solar cell as discussed above for claim 12 or claim 13 above. Wariishi '765 further discloses that the semiconductor layer has a specific surface area of 2 m<sup>2</sup>/g (Col. 26, lines 14-22). However, Wariishi '765 is silent as to whether the semiconductor layer has a specific surface area of from 10-200 m<sup>2</sup>/g.

Sugihara discloses a dye-sensitized solar cell (Col. 1, lines 33-37) wherein the semiconductor layer has a specific surface area of 100 m<sup>2</sup>/g. Sugihara uses the specified surface area because this allows for a solar cell with high performance (Col. 5, lines 38-40).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize the specific surface area of Sugihara in the dye-sensitized solar cell of Wariishi '765 in view of Wariishi '080, because this allows for a solar cell with high performance, as taught by Sugihara.

18. Claims 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Wariishi '080 as applied to claim 11 above, and further in view of Cox et al. (US 3240730)

Regarding claims 31-33, Applicant is directed above for complete discussion of Wariishi '765 in view of Wariishi '080 as applied to claim 11. Wariishi '080 further teaches a crosslinked polymer used for dye sensitized solar cell is formed by reacting an electrophilic reagent having bi- or higher functionality to react on a nitrogen-containing polymer, wherein the functional group of the electrophilic reagent is isocyanate (See Summary of Invention, and paragraph 0023). The references are silent as to whether the compound A is selected from the listed compound in the instant claims.

Cox et al. teaches including a catalyst in reaction of isocyanate compound and hydrogen containing compound such as amino group (See col. 1 lines 18-34), wherein the catalyst can be amine or organometallic (See the whole document). Cox et al. teaches reacting isocyanate group and amino group; wherein the isocyanate group can be tolylene diisocyanate, diphenylmethane diisocyanate, naphthalene diisocyanate, hexamethylene diisocyanate, xylene diisocyanate, cyclohexyl diisocyanate (col. 11, lines 1-75)

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It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the solar cell of Wariishi '765 in view of Wariishi '080 by incorporating compound A of Cox et al., because Wariishi '080 suggests reacting isocyanate groups with nitrogen-containing groups to form the crosslinked polymer. Since Wariishi and Cox et al both are concerned with reacting isocyanate group with amino group (or compound with active hydrogen), one would have a reasonable expectation of success from the combination.

19. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Wariishi '080 as applied to claim 11 above, and further in view of Frisch et al. (US 4742128).

Wariishi '765 in view of Wariishi '080 discloses a dye-sensitized solar cell as discussed above for claim 11. The references are silent as to whether compound B is selected from the group consisting of: selected from the group consisting of: diethyltoluenediamine, dimethylthiotoluenediamine, and a trifunctional polyetheramine.

Frisch teaches the use of trifunctional polyetheramine (JEFFAMINE T-3000) to react with isocyanate group is advantageous because of its equivalent weight (col. 15, lines 3-38).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have used trifunctional polyetheramine of Frisch in the network structure of '765 in view of Wariishi (EP, as the use of trifunctional polyetheramine (JEFFAMINE T-3000) to react with isocyanate group is advantageous, as shown by Frisch. In addition, the selection of a known material based on its suitability for its



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intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See MPEP § 2144.07.

20. Claim 18-23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Wariishi '080, and further in view of Takaoka.

Regarding claims 18-21, Wariishi '765 discloses a dye-sensitized solar cell comprising a transparent substrate (transparent substrate 50a, fig. 1; Col. 22, lines 13-37), a transparent electrically-conductive membrane (transparent electrically conductive layer 10a, fig. 1; Col. 22, lines 13-37) formed (see fig. 1 which shows that 10a is formed on 50a) on the surface of the transparent substrate (50a), an electrically-conductive substrate (top transparent substrate 50a, fig. 1; Col. 22, lines 13-37) disposed opposed to the transparent electrically-conductive membrane (10a), a porous semiconductor layer having a dye adsorbed thereto (photosensitive layer 20 comprising semiconductor particles 21 sensitized by a dye 22, Col. 22, lines 13-19; see also fig. 1) and an electrolyte (charge transport layer 30 containing electrolyte composition, Col. 55, lines 1-10, Col. 22, lines 13-37; see also fig. 1) interposed between said transparent electrically-conductive membrane (10a) and said electrically-conductive substrate (top 50a), said electrolyte comprising a molten salt ("The electrolyte composition ... comprises...a salt having a low melting point, a so-called molten salt", Col. 5, lines 26-38) incorporated in a network structure (The electrolyte composition is gelled or solidified by a cross-linking reaction of a polymer, Col. 19, lines 53-57) obtained by crosslinking at least one kind of Compound A having isocyanate groups per molecule

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(cross-linking agent...acyl isocyanates; Col. 21, lines 53-57) with a nitrogen containing group (pyridine group; Col. 21, lines 44-57).

Network is an interconnected or interrelated chain, group (Dictionary definition of "network" provided by Merriam-Webster Online Dictionary). Since the crosslink interconnects the isocyanate and amino group, Wariishi inherently discloses that the cross-linking reaction of polymers allows forming a network structure.

Wariishi '765 is silent as to whether the network structure is obtained by crosslinking disclosed isocyanate group with at least one compound C having one or more carboxyl groups and/or hydroxyl groups.

Wariishi '080 describes a photovoltaic cell of dye sensitization type comprising a transparent substrate (7), a transparent conductive film (6) formed on a surface, a conductive substrate (combination of glass layer 1 and conductor layer 2) opposite to conductive film (6), a porous semiconductor layer (3) in which a dye is adsorbed (dye layer 4), and an electrolyte layer (electrolyte containing crosslinked polymer, see abstract) between the transparent conductive film (2) and conductive substrate (6+7). (See paragraphs [0087]-[0090]). The electrolyte is a gel electrolyte containing a redox material and a solvent capable of dissolving the redox material in a network structure (See paragraphs [0033]-0036]). The network structure is formed by crosslinking a least one kind of compound A (electrophilic reagent) having bi-or higher functionality such as isocyanate to react on a nitrogen-containing polymer (See section titled "Summary of the Invention" and paragraph [0023]) and at least one kind of compound C having carboxyl group (-COO-) (linking group) repeated by a factor of x ([0011]-[0021]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have formed the network structure as disclosed by Wariishi '080 in the solar cell of Wariishi '765 in order to allow for a solar cell which possesses excellent photoelectric characteristics and durability (see abstract of Wariishi '080).

The references are also silent as to whether the at least one of said Compound A and said Compound C comprises a polymer structure having a molecular weight of from 500 to 100,000.

Takaoka teaches the crosslinking polymer structure involved in forming gel electrolyte having a molecular weight of 20,000 or less, in solid electrolyte is 5000 - 20,000 (Col. 15 lines 52-58). The ranges of molecular weight of 20,000 or less for gel electrolyte and 5000 - 20,000 for solid electrolyte are well within the claimed range of 500 - 50,000 for gel electrolyte, and 500 - 20,000 for solid electrolyte. Takaoka uses a low molecular weight polymer because it allows for a reduced difficulties in handling the polymer (Col. 15, lines 52-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified molecular weight of Takaoka in the dye-sensitized solar cell of Wariishi, because it allows for a reduced difficulties in handling the polymer, as taught by Takaoka.

The references are also silent as to whether a part or whole of the polymer structure of said Compound A and said Compound B comprises one or more selected from the group consisting of polyether, polyester, polycaprolactone, polysiloxane, polyolefin, polybutadiene, polyisoprene, polycarbonate and polyphosphazene.

Takaoka teaches the polymer structure, either entirely or partially, is one or more selected from a group consisting of polycarbonate (See '383 col. 6 line 48), polyester (Col. 6, lines 48-49), polyether (Col. 6 lines 64-66 and Col. 7 lines 1-5), polysiloxane (See formula B-1). Takaoka also teaches using polyether that has formulae equivalent to applicant's formula (I) (Col. 7 lines 1-5). Takaoka uses the specified polymer because it provides for an excellent ionic conductivity (Col. 1, lines 35-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified polymer structure of Takaoka in the dye-sensitized solar cell of Wariishi, because it allows for an excellent ionic conductivity, as taught by Takaoka.

Regarding claims 22 and 23, Wariishi '765 further discloses that the electrolyte comprises an oxidation-reduction pair (formula 1 on Col. 5, line 38 shows a positive cation and negative anion as the oxidation-reduction pair; See also Col. 7, lines 8-15 and Col. 55, lines 51-54).

21. Claims 18 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wariishi '765 in view of Yamaguchi (JP 2002-184478, refer to online translation) and Takaoka and Koehler et al. (US 4246364).

Regarding claims 18 and 36, Wariishi '765 discloses a dye-sensitized solar cell comprising a transparent substrate (transparent substrate 50a, fig. 1; Col. 22, lines 13-37), a transparent electrically-conductive membrane (transparent electrically conductive layer 10a, fig. 1; Col. 22, lines 13-37) formed (see fig. 1 which shows that 10a is formed on 50a) on the surface of the transparent substrate (50a), an electrically-conductive

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substrate (top transparent substrate 50a, fig. 1; Col. 22, lines 13-37) disposed opposed to the transparent electrically-conductive membrane (10a), a porous semiconductor layer having a dye adsorbed thereto (photosensitive layer 20 comprising semiconductor particles 21 sensitized by a dye 22, Col. 22, lines 13-19; see also fig. 1) and an electrolyte (charge transport layer 30 containing electrolyte composition, Col. 55, lines 1-10, Col. 22, lines 13-37; see also fig. 1) interposed between said transparent electrically-conductive membrane (10a) and said electrically-conductive substrate (top 50a), said electrolyte comprising a molten salt ("The electrolyte composition ... comprises...a salt having a low melting point, a so-called molten salt", Col. 5, lines 26-38) incorporated in a network structure (The electrolyte composition is gelled or solidified by a cross-linking reaction of a polymer, Col. 19, lines 53-57) obtained by crosslinking at least one kind of Compound A having isocyanate groups per molecule (cross-linking agent...acyl isocyanates; Col. 21, lines 53-57) with a nitrogen containing group (pyridine group; Col. 21, lines 44-57).

Network is an interconnected or interrelated chain, group (Dictionary definition of "network" provided by Merriam-Webster Online Dictionary). Since the crosslink interconnects the isocyanate and amino group, Wariishi inherently discloses that the cross-linking reaction of polymers allows forming a network structure.

Wariishi '765 is silent as to whether the network structure is obtained by crosslinking compound A having two isocyanate groups with compound C being selected from the group consisting of: difunctional ethylene oxide/propylene oxide copolymer obtained using glycerin as a starting material, trifunctional ethylene

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oxide/propylene oxide copolymer obtained using ethylene glycol as a starting material, polyether-modified polycarbonate diol, and polyethyleneglycol.

Yamaguchi discloses a photoelectric conversion device wherein the crosslinked polymer is obtained by a reaction of polyethyleneglycol (alkylene derivatized hydroxyl groups having glycol derivative and carbon being ethyl group) ([0025-0029]) with the tolylene diisocyanate ([0024]). Yamaguchi uses a crosslinked polymer obtained by polyethyleneglycol and tolylene diisocyanate because it allows for a device with an excellent durability (see abstract) by generating electrochemical stability ([0023]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to utilize a crosslinked polymer of Yamaguchi in the electrolyte of Wariishi '765, because it allows for a device with an excellent durability by generating electrochemical stability, as taught by Yamaguchi.

Wariishi '765 is also silent as to whether the at least one of said Compound A and said Compound C comprises a polymer structure having a molecular weight of from 500 to 100,000.

Takaoka teaches the crosslinking polymer structure involved in forming gel electrolyte having a molecular weight of 20,000 or less, in solid electrolyte is 5000 - 20,000 (Col. 15 lines 52-58). The ranges of molecular weight of 20,000 or less for gel electrolyte and 5000 - 20,000 for solid electrolyte are well within the claimed range of 500 - 50,000 for gel electrolyte, and 500 - 20,000 for solid electrolyte. Takaoka uses a low molecular weight polymer because it allows for a reduced difficulties in handling the polymer (Col. 15, lines 52-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified molecular weight of Takaoka in the dye-sensitized solar cell of Wariishi, because it allows for a reduced difficulties in handling the polymer, as taught by Takaoka.

Wariishi '765 is also silent as to whether a part or whole of the polymer structure of said Compound A and said Compound B comprises one or more selected from the group consisting of polyether, polyester, polycaprolactone, polysiloxane, polyolefin, polybutadiene, polyisoprene, polycarbonate and polyphosphazene.

Takaoka teaches the polymer structure, either entirely or partially, is one or more selected from a group consisting of polycarbonate (See '383 col. 6 line 48), polyester (Col. 6, lines 48-49), polyether (Col. 6 lines 64-66 and Col. 7 lines 1-5), polysiloxane (See formula B-1). Takaoka also teaches using polyether that has formulae equivalent to applicant's formula (I) (Col. 7 lines 1-5). Takaoka uses the specified polymer because it provides for an excellent ionic conductivity (Col. 1, lines 35-38).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified polymer structure of Takaoka in the dye-sensitized solar cell of Wariishi, because it allows for an excellent ionic conductivity, as taught by Takaoka.

### ***Response to Arguments***

22. Applicant's arguments with respect to claims 11-36 have been considered but are moot in view of the new ground(s) of rejection as necessitated by the amendments.

Applicant argues that “support for the amendments can be found in the specification at, for example, the examples, as shown in Appendix A hereto” (see Remarks, page 1).

The Examiner respectfully disagrees. The only relevant portion of the specification of Instant application that talks about mixing ratio of compound A with compound B/C is as follows:

The mixing ratio of the aforesaid Compound A and Compound B or Compound A and Compound C depends on which Compound A is combined with Compound B or Compound C and can be properly determined by the crosslinkability of the polymer, the properties required for dye-sensitized solar cell, etc. (page 14 of Specification OR [0047] of publication).

There is nothing specifically mentioned about the proviso. First of all, the proviso is not explicitly stated in the original disclosure. In addition, all the examples does not satisfy the proviso – “...if compound A has two isocyanate groups, compound B has at least three amino groups” as recited in lines 10-13 of claim 11, and “...if the number of isocyanate groups in A is two, the number of carboxyl groups, or the number of hydroxyl groups, or the number of hydroxyl and carboxyl groups combined in compound C is at least three” as recited in lines 16-18 of claim 18. All the examples of Applicant's disclosure only demonstrates that compound A either having two isocyanate groups or obtained from a reaction of a compound having two isocyanate groups and a compound having two amino/ carboxyl/hydroxyl groups. In addition, not all the examples satisfy the proviso. Hence, there is no portion in Applicant's originally filed disclosure provides “with the proviso that, if compound A has two isocyanate groups, compound B has at least three amino groups” or “with the proviso that, if the number of isocyanate groups in A is two, the number of carboxyl groups, or the number of hydroxyl groups, or the



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number of hydroxyl and carboxyl groups combined in compound C is at least three". To satisfy the written description requirement, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. See, e.g., *Moba, B.V. v. Diamond Automation, Inc.*, 325 F.3d 1306, 1319, 66 USPQ2d 1429, 1438 (Fed. Cir. 2003); *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 1116. The fact that pointing to a different reference to show a change to the disclosed invention may have been obvious to one of ordinary skill in the art does not demonstrate that the inventor had possession of such a modified invention at the time the application was filed. Obviousness is not the standard of support under 35 U.S.C. 112, 1<sup>st</sup> paragraph.

Applicant also argues that "Wariishi et al. do not suggest let alone teach an electrically- conductive substrate disposed opposite to an electrically-conductive membrane that is on the surface of a transparent substrate" (Remarks, page 3).

The Examiner respectfully disagrees. Wariishi discloses a dye-sensitized solar cell comprising a transparent substrate (transparent substrate 50a, fig. 1; Col. 22, lines 13-37), a transparent electrically-conductive membrane (transparent electrically conductive layer 10a, fig. 1 ; Col. 22, lines 13-37) formed (see fig. 1 which shows that 10a is formed on 50a) on the surface of the transparent substrate (50a), an electrically-conductive substrate (40a, fig. 1 ; Col. 22, lines 13-37) disposed opposed to the transparent electrically-conductive membrane (10a). It was only a mischaracterization of the reference number, but Wariishi as a whole discloses the claimed invention.

Applicant also argues that “Applicants respectfully submit that the skilled artisan reading Applicants' entire disclosure would instantly recognize that "amino group" in Applicants' claims refers to the  $-NH_2$  substituent. In support of this position, Applicants attach as Appendix B the relevant pages from a treatise on organic chemistry, showing that, historically, "amino group" refers to  $-NH_2$ ” (Remarks, page 3).

The Examiner respectfully disagrees. Amino group can be primary ( $-NH_2$ ), secondary ( $-NH$ ) or tertiary ( $-N$ ), and Applicant does not explicitly claim that the amino group is primary amine ( $-NH_2$ ). In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., amino group being  $-NH_2$  substituent) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant also argues that “Takaoaka et al. is directed to conductive materials for batteries, an application where optical transparency is, at least in the first instance, wholly irrelevant. The skilled artisan of the day would have looked to Takaoaka et al. for guidance in constructing batteries, not for guidance in constructing a solar cell having an electrically-conductive substrate to dispose in opposition to an electrically conductive membrane. Batteries store energy. Solar cells generate energy. A conductive gel for the one does not suggest a conductive gel for the other” (Remarks, page 5).

The Examiner respectfully disagrees. In response to applicant's argument that Takaoka is nonanalogous art, it has been held that a prior art reference must either be

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in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Takaoka teaches the crosslinking polymer structure involved in forming gel electrolyte having a molecular weight of 20,000 or less, in solid electrolyte is 5000 - 20,000 (Col. 15 lines 52-58). The ranges of molecular weight of 20,000 or less for gel electrolyte and 5000 - 20,000 for solid electrolyte are well within the claimed range of 500 - 50,000 for gel electrolyte, and 500 - 20,000 for solid electrolyte. Takaoka uses a low molecular weight polymer because it allows for a reduced difficulties in handling the polymer (Col. 15, lines 52-54). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the specified molecular weight of Takaoka in the dye-sensitized solar cell of Wariishi, because it allows for a reduced difficulties in handling the polymer, as taught by Takaoka.

### ***Conclusion***

23. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

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mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Correspondence/Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GOLAM MOWLA whose telephone number is (571) 270-5268. The examiner can normally be reached on M-F, 0900-1700 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ALEXA NECKEL can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/G. M./  
Examiner, Art Unit 1795

/Alexa D. Neckel/  
Supervisory Patent Examiner, Art Unit 1795